Copper and Copper Alloys

Copper Wire Data

CDA ALLOY NO.	ALLOY NAME	COMPOSITION	TENSILE STRENGTH		YIELD STRENGTH		ELONGATION		ELECTRICAL CONDUCTIVITY	ELECTRICAL RESISTIVITY	DENSITY	MELTING POINT APPROX
			KPSI		KPSI		%					
		%	Hard	Soft	Hard	Soft	Hard	Soft	IACS (68°F)	OHMS/CMF	lb/in³	°C
C10100	Certified OFHC Copper	Other, 99.99 Cu min.	55	34	50	11	6	36	101	10.3	0.323	1,083
C10200	OFHC Copper	Other, 99.95 Cu min.	55	34	50	11	6	36	101	10.3	0.323	1,083
C11000	ETP Copper	.04 O, 99.90 Cu min.	55	34	50	12	5	36	100	10.3	0.323	1,065
C15000	Zirconium Copper	.15 Zr, 99.85 Cu	64	30	62	13	1.5	30	93	11.2	0.321	980
C17200	Beryllium Copper	1.9 Be, 98.1 Cu	152	68	125	28	1	42	22	46.2	0.298	866
C26000	Cartridge Brass	30 Zn, 70 Cu	109	52	68	21	5	30	28	37.0	0.308	916
C51000	Phosphor Bronze	5.0 Sn, .2 P, 94.8 Cu	110	51	85	21	5	49	15	69.1	0.32	954

Properties are nominal values, and should not be used for specification purposes. Elongation values are generally size dependent.

Certified OFHC Copper (CDA C10100)

This is an unalloyed, high purity copper that has excellent forming and brazing characteristics, as well as resistance to hydrogen embrittlement at elevated temperatures. It has good solderability and corrosion resistance, and may be used in any high current application. Both grades of OFHC copper are available in round and shaped wire and may be substituted for ETP copper wherever optimal properties of copper are desired.

OFHC Copper (CDA C10200)

OFHC copper has 99.95% minimum copper (silver counted as copper) and is produced by converting cathodes in a continuous casting and rolling process into copper rod. Typical uses include bus bars or any electrical conductor, and it may be specified as a special magnet wire conductor.

ETP Copper (CDA C11000)

Electrolytic tough pitch copper is intentionally alloyed with oxygen to achieve the best combination of conductivity, capacity for being cold worked, and economy. This is the most widely used copper for wire conductors and is available in round, square and rectangular shapes.

Zirconium Copper (CDA C15000)

This copper alloy exhibits high conductivity, excellent solderability, and good strength. Unlike ETP and the OFHC coppers, zirconium copper resists softening at higher temperatures. Typical applications include switches, high current interconnects, terminal pins, welding tips, and other applications where high temperatures exist.

Beryllium Copper (CDA C17200)

This alloy is characterized by very high strength and good electrical conductivity. Normally supplied in age-hardenable tempers, beryllium copper has good to excellent cold workability. This alloy is available as bare wire or it can be film insulated. Typical uses include switch parts, springs, fuse clips, connectors, and contacts.

Cartridge Brass (CDA C26000)

Cartridge brass has good conductivity and strength, but poor solderability due to its high zinc content. This copper alloy is widely used for cold-headed products such as machine and wood screws, rivets, and fasteners. It may also be used as an economical spring material.

Phosphor Bronze (CDA C51000)

This alloy is widely used for most types of springs because of its high strength and resistance to corrosion and fatigue. It is also used in switches, relays, contacts, and fasteners.

MWS offers High Performance Wire in Extra (XHTW) and Extreme (EHTW) tensile strength with all insulation types and as bare wire. Most alloys are available with nickel, silver, or gold plating.

MWS High Performance Wire (HPW) products are copper alloy conductors specifically designed for applications with high mechanical stress that also require high conductivity. Through improved characteristics of the wire, lifespan and reliability under dynamic load are increased.

High Strength Wire

METAL		COPPER	BERYLLIUM COPPER	PHOSPHOR BRONZE	XHTW	EHTW
Description		ETP C11000	C17200	C51000	Extra High Tensile Wire	Extreme High Tensile Wire
Density	(lb/cu in)	0.323	0.298	0.32	0.325	0.325
Conductivity	(% IACS-Soft)	100	22	15	89	80
Electrical Resistance	(ohms/cir mil ft)	10.3	46.2	69.1	11.8	12.9
Tensile (Soft)	ksi	34	68	51	50	56
Tensile (Hard)	ksi	55	152	110	62	68
Elongation (a)	%	6 to 36	1 to 42	5 to 49	10 to 25	10 to 30
Solderability		Excellent	Good	Excellent	Good	Good
Weldability		Excellent	Good	Excellent	Good	Good
Bend Test (b)		100			600	1,050

(a) Tensile and elongation values are nominal and generally size dependent

(b) Fatigue strength compared to annealed copper

Wire Properties

- Increased Tensile Strength – over 50% greater than ETP copper
- High Conductivity – up to 89% of ETP copper
- Good Solderability and Weldability – no performance loss compared to copper
- Increased Bending Performance – better fatigue strength results in fewer wire breaks in cable constructions

Applications

- Catheter electrode wires
- Severe coil winding applications
- Voice coils
- Miniature cables
- Aerospace applications